# THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI.

## A STUDY ON *URINARY*

## *TRAUMA* AT

## GOVT. RAJAJI HOSPITAL, MADURAI.

Dissertation for Branch- 1

# M.S.,(GENERAL SURGERY)

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**DEPARTMENT OF GENERAL SURGERY,**

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# CERTIFICATE

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# A STUDY ON GENITOURINARY TRAUMA

## INTRODUCTION

### *TRAUMA* -- PAST Vs PRESENT

The nature , severity , modus as well as the weapon have changed a lot albeit the fact *"the more things change , the more they remain the same!"*

From the days of sharp injuries inflicted with edged weapon with purpose, the present scene depicts more of unpurported BLUNT injuries – the result of change in civilization.

Trauma ranks as a major cause of morbidity and mortality along with atherosclerotic disease and malignancy. Trauma is the leading cause of death in first four decades of life. High speed vehicles, decivilization of human race, terrorism, sports and accidental injuries are the predisposing factors for trauma. Major trauma does not respect or restrict itself to one organ or system.

The genitourinary tract is frequently involved in various types of injuries to the abdomen , pelvis and chest, though it is fairly well protected from external violence and penetrating injuries, by the surrounding musculoskeletal structures and the inherent mobility of most of the urinary tract.

In the management of trauma the ***surgeon*** being the " *FIRST CALL" ATTENDENT* , should be certain that priorities in system care are observed before focussing on the urinary tract.

Multiple-organ injuries , exsanguinating haemorrhages, delayed presentations and the ominous reputation for high morbidity and mortality are just few of the reasons which makes this topic an interesting one.

# REVIEW OF ANATOMY

A brief review of the anatomy of the urinary tract is necessary to appreciate various aspects of its trauma.

## KIDNEYS :

The kidneys lie high up on the posterior abdominal wall behind the peritoneum largely undercover of the costal margins and lie obliquely with long axis parallel to the lateral border of the psoas major. The normal kidney measures about 12 x 6 x 3 cm and weighs about 130 gms.

The hilum of the right kidney lies below and the left lies above the *transpyloric plane,* 5 cms from midline. The right lies at a lower level because of the liver.

The upper pole of the left kidney overlies the eleventh rib. The relations of kidney- posteriorly the diaphragm, quadratus lumborum which overlap medially the psoas, laterally the transersus abdominis. The anterior relations of right kidney are duodenum, hepatic flexure, coils of jejunam, liver and that of the left are the tail of pancreas, splenic flexure and stomach. The right adrenal is pyramidal and surmounts the upper pole of kidney whereas the left adrenal is cresentric and lies on the medial border above the hilum.

## BLOOD SUPPLY

The renal arteries leave the aorta at right angles and divides into three branches to enter the hilum, two in front and one behind the renal pelvis. The two upper branches supply the anterior and posterior halves of the lower pole. And hence, the kidney is split longitudinally than transversely. The constant anatomy of the renal arteries, posterior to renal veins is important in controlling the renal pedicle initially before opening Gerota's fascia. They are drained by renal veins, into the inferor venacava.

Perinephric fat lies outside the renal capsule like an inverted cone, in the hollow of the paravertebral gutter maintaining kidney in position. Perinephric fascia surrounds the fat, separating kidneys from the adrenals.

## URETER :

The ureter is 25 cms long and passes down on psoas major beneath the peritoneum crossing genito femoral nerve. It's crossed by the gonadal vessels.

The right ureter is behind the duodenum, crossed by root of the mesentry and by right colic, ileocolic and superior mesenteric vessels. The left is lateral to inferior mesenteric vessels, crossed by left colic

vessels and sigmoid mesocolon. It leaves the psoas major at the bifurcation of common iliac artery, over the sacroiliac joint and runs into pelvis. It's plastered to posterior wall by the peritoneum and the gonadal vessels lies between them.

**PELVIC URETER**

Crosses the pelvic brim at the bifurcation of common iliac vessels and passes in contact with pouch of Douglas towards the spine of ischium. It runs forward above pelvic floor to pass into the base of the bladder.

**BLOOD SUPPLY**

Upper end is supplied by ureteric branch of renal artery. Lower end by inferior or superior vesical artery. Middle part from gonadal or common iliac vessels. Veins drain into renal, gonadal and internal iliac veins. Lymphatics accompany the corresponding veins.

Pelvic part of the ureter must be mobilized by dividing the fascia on the medial side as the vessels reach them from the lateral side. The reverse is true for the abdominal part of the ureter.

**BLADDER :**

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The distended bladder is globular while the empty bladder is flattened from above downwards. The fundus lies behind the symphysis pubis, separated by a space – retropubic space of Retzius – made of areolar tissue. The superior surface is covered by peritoneum.

The trigone and base of the bladder is immobile and not distendable. The trigone is triangular area in between the ureteric orifices and the urethral orifice. Bladder is related to the prostate in the male and to the cervix and anterior fornix in the female.

**BLOOD SUPPLY**

Superior and inferior vesical arteries, twigs from the pubic branch of the inferior epigasric artery. Venous drainage is into the internal iliac via the vesical plexus.

Sympathetic innervation is from L1 & L2.

Parasympathetic is from S2,S3 & S4.

**SPHINCTERS :**

***INTERNAL SPHINCTER***- situated in the neck of the bladder made of smooth muscles with autonomic innervation. Normal tone maintains continence and emptying is by its relaxation. This muscle lies proximal to the ejaculatory ducts and thus prevents reflux of ejaculatory fluid into the bladder.

***EXTERNAL SPHINCTER***- is a striated muscle arising from the ramus of the pubis. Situated distal to the internal sphincter it surrounds the urethra between the urogenital diaphragm. It is under voluntary control.

**URETHRA :**

Length is 20cm in males and 4cm in females. Prostatic urethra extends from bladder to external sphincter. Verumontanum is a projection in posterior wall. The prostatic glands drain into the prostatic sinuses and ejaculatory ducts open at the prostatic utricle at the apex. Membranous urethra is the shortest part and is surrounded by the external sphincter.Penile urethra is enclosed by the corpus spongiosum. The proximal end of the penile urethra has a bulb. Fossa navicularis is a slight enlargement at the distal end. The external urethral meatus is the narrowest part of the lower urinary tract, followed by the membranous urethra.

## PATHOPHYSIOLOGY & MANAGEMENT OF

## RENAL INJURIES

Trauma to the kidney is by 2 ways.

1. BLUNT TRAUMA

   Road traffic accidents / Fall from a height

2. PENETRATING TRAUMA

   Stab injury / Gun shot / Bull-gore injury

## HISTORY

**Blunt injury**

Nature of accident

Acceleration / Deceleration force

Site of direct / indirect impaction on the body

Penetrating injury

Size of weapon

Callibre of bullet

H /O Loin pain

H /O pre-existing renal abnormality

H /O Hematuria

## GENERAL EXAMINATION

In case of penetrating injury, the entry / exit / stab wounds are in the lower thorax or the loin.

In case of blunt injury,

Bruises over flank

Fullness in the renal angle

Macroscopic hematuria

## MECHANISM OF INJURY

1) Due to shearing forces that exceed the tensile strength of the renal parenchyma.

2) Blunt trauma is due to sudden deceleration the body.

3) The kidney is thrust against the rib cage / vertebrae results in contusion / laceration / avulsion of pedicle.

4) Sudden deceleration stretches the artery and produces tear in the intima and subintimal damage.

**PENETRATING TRAUMA**

Due to the obvious tissue disruption to the parenchymal collecting system and vasculature.

**CLASSIFICATION OF RENAL INJURY**

(Peters PC & Bright TC)

Minor 70 – 80 %

Superficial lacerations,

Subcapsular hematomas

Contusions.

Major 10 – 15 %

a) Deep parenchymal lacerations through corticomedullary junction
b) Renovascular pedicle injury
c) Shattered kidneys.

In 10% of abdominal trauma renal injuries are present. Most common associated injuries are to the liver, spleen, small bowel, stomach and pancreas.

## RENAL INJURY SCALE OF THE AMERICAN ASSOCIATION FOR SURGERY OF TRAUMA

| GRADE | DESCRIPTION |
|---|---|
| I – Contusion | Microscopic / gross hematuria urologic studies normal. |
| II – Hematoma | Subcapsular, non expanding hematoma without parenchymal laceration.<br>Non – expanding perirenal hematoma confined to retroperitoneum |
| III – Laceration | < 1 cm of parenchymal depth of renal cortex without urinary extravasation |
| IV – Laceration | > 1 cm of parenchymal depth of renal cortex without collecting system rupture ;<br>Urinary extravasation |
| V – Vascular | Main renal artery or vein injury with contained haemorrhage. |

The determinant of mortality in renal trauma is the nature and extent of non renal injuries. Renal pedicle injury carries high mortality and nephrectomy rate.

## EVALUATION AND DIAGNOSIS

History is very important. A high index of suspicion should be there. Flank pain and hematuria warrants evaluation regardless of the apparent location of trauma. The degree of hematuria may bear no relationship to the severity of renal injury.

*PLAIN X-RAY ABDOMEN*

- Lower rib / vertebral fracture
- Ground glass density over renal area
- Obliteration of Psoas muscle shadow
- Scoliosis to the side opposite to the injury

*HIGH DOSE IVP*

Excellent initial imaging study. Bolus infusion of sodium meglumine diazotroate contrast in dose of 1 ml/kg at 1, 5, 15 & 30 mts. To determine,

I. If both kidneys are present and functioning

II. To delineate the parenchymal and collecting system

**NON VISUALISATION OF IVP**

Renal absence - congenital / surgical, renal ectopia, shock, renovascular spasm, renal artery thrombosis and avulsion of renal pedicle.

Accuracy is 87% in blunt trauma and 68% in penetrating trauma.

***Computerised Tomogram (CT)***

Greater sensitivity and specificity than IVP. In CT renal ectopia, minor degree of extravasation, major parencymal lacerations, hematomas and devacularisation can be visualized clearly.

- *Intrarenal hematomas* - round poorly marginated lesion with decreased blood in perinephric fat.
- *Renal lacerations* and *urine extravasations* are well shown after injections of contrast material.

***Renal arteriography and renal angiogram***

Has decreased because of CT and indicated in

- Non –visualisation or poor visualization on IVP/CT.
- Renal artery thrombosis
- Severe contusion with spasm

***ARTERIOGRAPHY***

May reveal preservation of arterial supply to all renal segments despite complete parenchymal rupture. These injuries heal without surgery. Identification of devascularised renal segments is important. Necrosis, urine leak, abscess formation or hypertension may occur unless devitalized tissue is debrided and drained.

***<u>Indications for surgery in Renal Trauma:</u>***

1. Uncontrolled bleeding
2. Renovascular Injury
3. Non viable parenchyma
4. Major urinary extravasation

In Blunt injuries,

i. 80 – 85% observation and bed rest.

ii. 10% require surgery (renal pedicle trauma)

In penetrating injuries,

50% require surgery

## SURGICAL TECHNIQUES

- Vertical midline incision from xiphoid to pubis for speed of opening and closure and for maximum exposure.
- Complete laparotomy is done and active bleeding is controlled
- An incision made in posterior parietal peritoneum parallel to the inferior mesenteric vein. Additional exposure by a peritoneal incision around the caecum.
- Cephalad retraction on the pancreas exposes the left renal vein as it crosses over the aorta
- Routine exposure of renal vessels before opening Gerota's fascia allows a higher renal salvage rate and adds to the safety of the procedure.
- Renal veins mobilized to reveal the renal arteries.
- Origin of right and left main renal arteries is posterior to the junction of renal vein and IVC. Vessel loops are placed around the renal arteries so that a vascular clamp can be applied.
- Renal capsule is reflected from traumatized tissue and preserved for closure of defects in parenchyma
- Traumatized parenchyma is debrided sharply
- Severe polar injuries are best treated by guillotine amputation to avoid necrosis or fistula formation.

- Openings into the collecting system is closed with 4-0 chromic catgut or polyglycolic acid.
- Injuried intraprenchymal vessels are oversewn.
- Approximation of renal capsule over the injured area is desirable. Perinephric/ omental fat/ free peritoneal graft is sutured to the capsular edges.
- Large parenchymal defects is fitted with topical agent such as oxycel or mattress sutures placed with 2-0 chromic catgut.
- Most shattered kidneys require nephrectomy to control haemorrhage.
- In patients with solitary kidney or bilateral renal trauma – absorbable polyglycolic acid mesh is wrapped around to provide tamponade effect.
- Segmental renal vein injuries are simply ligated and renal arterial injuries repaired primarily.
- Major renal vein lacerations can be repaired directly by venorrhaphy.
- Repair of renal arteries includes resection and end to end anastamosis, bypass graft with autogenous vein or synthetic graft. Renovacular repairs are performed with 5-0 or 6-0 polypropylene.
- A closed suction drain is placed in the renal fossa.

**Postoperative care & management of complications**

- Patients are kept at bed rest until urine is grossly clear of blood and vital signs are stabilised.
- Hematocrit and creatinine levels measured serially
- Flank drains are removed after several days when there is no further evidence of urine leak/bleeding.
- Adherence to surgical principles prevents most delayed complications.
- Percutaneous drainage is an effective treatment of perinephric abscess, hematoma /urinoma.
- Selective angiographic embolization is the preferred treatment of delayed haemorrhage.
- Demonstration of retained renal function before the patient is discharged is desirable.

**PATHOPHYSIOLOGY AND MANAGEMENT OF URETERAL INJURIES**

Ureter is the least commonly injured portion of the Genitourinary tract because of its

- Small caliber and mobility.
- Well protected by back muscles and retroperitoneal fat.

## CAUSES OF URETERIC TRAUMA

Isolated ureteric injuries from trauma is very rare

Commonest is Iatrogenic injuries. They are

- In **Gynaecology** – Hysterectomy, Oopherectomy, Bladder neck suspension.
- In **general surgery** – Colectomy and appendicectomy
- **Vascular** – Aortoilliac bypass
- **Urology** – Ureterolithotomy, Ureteral reimplantation.
- Pelvic **Endoscopic / Laproscopic** procedures.

History and physical evidence of trauma to flank & pelvis increases the possibility of injury.

Hematuria

90% of ureteric trauma

10% of iatrogenic

## INVESTIGATIONS

IVP – 94% accuracy

*RETROGRADE PYELOGRAM*

This is one of the most precise preoperative study to localise the site and magnitude of extravasation (Benson) and is whether complete or partial.

## CLASSIFICATION OF URETERAL INJURIES

1. Mechanism – Blunt. Vessels -penetrating injuries
2. level of injury – Upper, Middle or Lower ureter.

   *Upper and lower thirds* – Vascular supply from renal hilum and iliac vessels.

   *Middle third* has a vulnerable blood supply.

   Iatrogenic injuries occur more commonly at the pelvic brim where the ureter crosses the common iliac artery and where it courses posterior to the broad ligament and ovarian vessels in female.
3. Recognition – Immediate versus delayed.

   Prompt diagnosis before inflammation and abscess formation may allow primary repair.

## THE USUAL LENGTH OF DEFECT THAT CAN BE BRIDGED WITH VARIOUS SURGICAL TECHNIQUES

| *URETERAL DEFECT* | *Procedure* |
|---|---|
| 2 -3 cms | Ureteroureterostomy |
| 4 -5 cms | Ureteroneocystostomy |
| 6 -10 cms | Ureteroneocystostomy with psoas hitch |
| 12 -15 cms | Ureteroneocystostomy with Boari flap |
| 5 -8 cms | Renal Descensus |

### *URETEROURETEROSTOMY*

Though the simplest, it's success depends on strict patient selection and precise technique. Most appropriate is a short defect involving the upper or mid ureter. Since tension on the anastamosis nearly always leads to stricture, only short defects are closed by ureteroureterostomy. The operative approach depends on level of ureteral trauma.

The flank approach accesses the upper ureter and a Gibson incision for mid ureter and the lower ureter can be approached through a lower midline incision.

Enough mobility is needed to avoid tension once the diseased ureter is excised. The ureter is trimmed,mobilized, alligned and sutured.

A double J stent is placed. Retroperitoneal fat or ometum is kept around the anastamosis. Drain kept, stent removed after 4-6 weeks by scopy.

***URETERONEOCYSTOSTOMY***

Lower ureteral injuries are best managed by this procedure with or without psoas hitch or Boari flap. It is indicated for injury affecting the distal 4 cms of ureter. By extra peritoneal approach the ureter is identified, mobilized proximally with adventitia and ureteroneocystostomy done as a tension free anastamosis.

A retrospective study showed that there is no difference in the preservation of renal function or risk of stenosis with reflux or antireflux procedures.

***PSOAS HITCH***

Popularised by Turner –Warwick and Worth in 1969, is an effective method of bridging a defect in lower ureter. A small shrunken bladder is a contraindication, for sufficient size and mobility may not be present.

A lower midline incision is made for bladder mobilization. By traction on the ipsilateral dome, the bladder reaches the level superior to the iliac vessels. Further mobility is by dividing the opposite superior

vesical artery. Ureter is mobilized and delivered intosuperolateral aspect of dome and anastamosed. Bladder dome is fixed to the psoas minor tendon or major muscle.

Psaos hitch provides additional 5 cms length with success rate of 95%. The most common complications are fistula and ureteric obstruction.

***BOARI FLAP***

Mid ureteral defects are a challenge because of the tenuous blood supply and problems arise in achieving a tension free repair. Boari described a technique in 1984 in canine model. It can bridge a 10 – 15 cms defect very well.

A direct refluxing anastamosis is used for such a flap. Results are good when vascular tissue is used (Ockerbald). Common complication is recurrent stricture formation

**PATHOPHYSIOLOGY & MANAGEMENT OF BLADDER INJURIES**

The type of bladder rupture depends:

In a full bladder, intraperitoneal rupture occurs

In an empty bladder, extraperitoneal rupture occurs

## HISTORY AND PHYSICAL EXAMINATION

History of blunt or penetrating trauma to lower abdomen or pelvis. H/o inability to pass urine.

HISTORY OF HEMATURIA

**On examination:**

Distension of abdomen.

Suprapubic tenderness

Diffuse tenderness lower abdomen

Bruises over suprapubic region

## URINE ANALYSIS

Look for hematuria – present in 95 % of cases.

Look for blood at meatus

## PENETRATING INJURIES

All such injuries by gun shots/ stabs/ bone fragments, should be surgically explored, because of the nature of the bladder and associated injuries. The peritoneum is routinely opened and explored for associated abdominal injuries.The lacerations are repaired with two layers of 3-0 chromic catgut or polyglycolic acid. Inspect trigone, uretric orifices and neck for injuries. Careful repair is done to decrease the post operative

extravasation, incontinence and stricture formation. After repair, a large bore SPC (22-24F) through a separate wound in the bladder dome to secure closure.

Two principles are remembered:

1. the tube is placed high in the bladder away from trigone to avoid frequency of urination and spasms.
2. the tube is brought obliquely through the abdominal wall to discourage fistula formation after tube is removed. SPC is removed after 10 – 14 days when a voiding cystogram shows the lacerations are healed.

*INTRAPERITONEAL RUPTURE*

Is best managed by surgical exploration and repair. Laproscopic repair is now being described. (Parra, 1994)

*EXTRAPERITONEAL RUPTURE*

Is better explored as blunt trauma requires a greater degree of judgment. Many heal with urethral catheter drainage for 7 - 10 days. If associated injuries are giving a doubt in diagnosis then surgical exploration is ideal.

*IATROGENIC BLADDER INJURIES*

Most common after gynecological procedures. The vesico-vaginal fistulas gain precedence over any other injury because of the high morbidity associated with it. The incidence of VVF associated with gynaec surgeries are high. The commonest cause of VVF are total abdominal hysterectomy followed by vaginal hysterectomy and radical vaginal hysterectomy. ( George & Miller )

The commonest site of injury is the supratrigonal area and the bladder base. This is due to inadequate mobilization of the bladder or vigorous blunt dissection in an improper plane or placement of sutures through the bladder base when vaginal cuff is sutured. The appearance of the VVF takes atleast 7 days to appear.

The main symptom is urinary incontinence with reddened vulva and excoriation. The odour of urea is there always. The findings are confirmed by cystoscopy. The ureteral orifices are visualized to look for the spurt of urine; an IVP is mandatory. Timing of repair is by preoperative assessement of patient from 2-12 weeks. The choice of approach depends on the case but a transvesical repair gives a rapid recovery.

A Pfannensteil incision is used, bladder opened and fistula identified. The margin of fistula is trimmed by an encircling incision around the fistula. The anterior vaginal wall is separated from the bladder wall. The vaginal wall is closed with 3-0 delayed absorbable and the bladder wall with 2-0 delayed absorbable sutures. A SPC and a Foleys catheter is kept for 10 days. If the fistula involves ureteral orifice a ureteroneocystostomy is to be combined.

## PATHOPHYSIOLOGY AND MANAGEMENT OF URETHRAL INJURIES

The urethra is divided into Posterior urethra which includes the prostatic and membranous urethra above or including the urogenital diaphragm and the Anterior urethra – which includes the bulbous and penile urethra.

Posterior urethra is the most commonly involved in violent shearing forces in high speed blunt/crush injuries or high velocity penetrating trauma. Pelvic fracture is present in greater than 90% of cases.

The symptoms are an attempt to void unsuccessful and gross hematuria.

O/E – there is blood at meatus, often bladder neck remains competent after injury and the degree of extravasation is minimal. Thus the amount of swelling of perineum, scrotum or penis is small.

P/R – after laceration of penile urethra, the bladder and prostate ascend above the normal anatomic position and the defect fills with blood and urine. A boggy fluid collection is present in normal location of prostate.

*IMAGING AND CLASSIFICATION OF INJURY*

Retrograde urethrography:

First AP film of pelvis – look for pelvic fracture, displacement of symphsis or any foreign objects. Next, in 30 degree oblique position, inject 25 ml of contrast into meatus. Film is taken during injection as it distends urethra. The oblique positioning offers the best demonstration of the entire urethra.

## TYPES OF POSTERIOR URETHRAL INJURIES

Type I – stretching and elongation of posterior urethra owing to a pelvic hematoma.

Type II – Partial / complete rupture of the posterior urethra – Extravasation is confined below urogenital diaphragm.

Type III – Most severe, twice common as Type I & II. Complete rupture of prostato membranous urethra with urogenital diaphragm and bulbous urethra.

| | **Primary repair** | **Delayed** |
|---|---|---|
| Stricture | 14% | 6% |
| Incontinence | 21% | 6% |
| Impotence | 33% | 10% |

Primary repair is indicated in severe prostatomembranous dislocation, major bladder neck laceration and concomitant pelvic vascular or rectal injury.

Advances in endoscopic techniques with flexible cystoscopy and the use of guide wires and the Seldinger technique are producing a reappraisal of both initial and delayed management of injuries.

**ANTERIOR URETHRA**

More common in blunt trauma i.e., straddle injuries, Pelvic fracture is uncommon. Other cases are fracture penis, gunshots, stabs or instrumentation and inflated Foley catheter balloon removal.

Clinical features – Urethral rupture through Buck's fascia results in extravasation of blood and urine confined to attachment of Colles fascia, posteromedially with fascia of transverse perineal muscles and laterally fascia Lata, superficially continues as Scarpa's fascia and inserts on coraco clavicular ligament. So extravasation contained by Colles fascia produces butterfly shape in the perineum.

**MANAGEMENT**

Imaging : Retrograde Urethrography

Findings – blood at meatus, evidence of penile, scrotal, perineal contusion or hematoma or fluid collection.

Treatment : Surgical exploration, debridement and direct repair. Partial lacerations are debrided and closed over an urethral catheter with 4-0 or 5-0 chromic catgut catheter is kept in situ 7-10 days.

Do a voiding cystourethrogram after catheter is removed.

Complete disruption – Direct end to end anastamosis.

Catheter left in situ for 10-14 days.

## AIM OF THE STUDY

The aim of this study is to evaluate the following aspects of urological injuries.

1. The incidence of urological trauma.
2. Mode of injury

   due to external trauma/

   due to iatrogenic trauma.
3. Clinical presentation
4. Associated organ and system involvement
5. Management

   - early

   - late
6. Prognosis.

# MATERIALS AND METHODS

This study consists of all urological injuries admitted in Government Rajaji Hospital, Madurai from Dec 2005 to May 2007.

Once the patient is admitted the Name, Age, Sex and Mode of injury are noted. The clinical evaluation is done in a systematic way.

After resuscitating the patients and whenever necessary the investigations are carried out. In those who are operated the operative findings and methods of management are recorded. The late management and prognosis are recorded. If death occurs the cause of death is evaluated. In those patients who died before surgery the post-mortem findings are noted. The above facts are recorded in a proforma prepared for the study.

## OBSERVATIONS MADE IN THE STUDY

The total number of patients confirmed to have sustained injuries to the retroperitoneal structures were 84. The total no. of cases with abdominal trauma were 435 patients. Thus retroperitoneal injuries accounts for about 16% of the trauma cases.

### RENAL INJURIES

Of these, those who had renal injuries were 20 – that forms about 23.8% of retroperitoneal injuries.

The other retroperitoneal structures affected were

| | | | |
|---|---|---|---|
| 1. | Renal injuries | 20 | 23.8% |
| 2. | Pancreatic injuries | 20 | 23.8% |
| 3. | Duodenum | 16 | 19.0% |
| 4. | Ureter | 04 | 4.8% |
| 5. | Retrohepatic venous injuries | 04 | 4.8% |
| 6. | Ascending colon | 02 | 4.2% |
| 7. | Retroperitoneal hematoma | 18 | 21% |
| | Total | 84 | |

Here Renal injuries tops the rest with 20 cases making 23.8% of retroperitoneal injuries.

## AGE AND SEX INCIDENCE

In this study of 20 patients with renal injuries 16 were male and only 4 were female. This gives a male to female ratio of 4:1. The high incidence of trauma in males may probably be due to the relative high association of males in vehicular accidents and acts of violence.

**TABLE 1**

**AGE AND SEX INCIDENCE**

| AGE GROUP | MALE | FEMALE | TOTAL |
|---|---|---|---|
| <10 | -- | -- | -- |
| 11-20 | 3 | -- | 3 |
| 21-30 | 3 | -- | 3 |
| 31-40 | 3 | 2 | 5 |
| 41-50 | 4 | 2 | 6 |
| >50 | 3 | -- | 3 |
| Total | 16 | 4 | 20 |

The youngest was a 17 year old boy who sustained stab injury to right hypochondrium and the oldest was a 58 year man who sustained stab injury. 70% belong to 20-50 years age group, the most productive years in a mans life.

**MODE OF INJURY**

Though Carlton et al., has reported that penetrating injuries account for only 10% of renal injury cases and in blunt injury accounts for 90%, in our study road traffic accidents caused only 9 of 20 cases i.e., 47% while penetrating injuries were 11 of 20 cases i.e., 53%

For blunt trauma to produce retroperitoneal injury the force must be severe and in such case death may occur immediately before the patient could be brought to the hospital. This may probably be the reason for the low number of blunt injuries as the patients who were brought dead were not included in the study.

**TABLE – 2**

| | | | |
|---|---|---|---|
| Penetrating injury | Stab injury | 11 | 53% |
| Blunt injuries | RTA | 9 | 47% |
| Total | | 20 | |

Time interval between and admission and injury and surgery were

**TABLE – 3**
**PENETRATING INJURIES**

| Time interval | Injury to admission | Admission to surgery |
|---|---|---|
| 2hrs | -- | 4 |
| 2 – 4 hrs | 2 | 4 |
| 4 – 6 hrs | 2 | 3 |
| 6 – 8 hrs | 3 | -- |
| 8 – 10 hrs | 2 | -- |
| 10 – 12 hrs | 1 | -- |
| >12 hrs | 1 | -- |

**TABLE – 4**
**BLUNT INJURIES**

| Time interval | Injury to admission | Admission to surgery |
|---|---|---|
| 2hrs | -- | -- |
| 2 – 4 hrs | 1 | -- |
| 4 – 6 hrs | 2 | 2 |
| 6 – 8 hrs | 2 | 3 |
| 8 – 10 hrs | 2 | -- |
| 10 – 12 hrs | 1 | -- |
| >12 hrs | 1 | -- |

## TABLE – 5

## INJURY TO OTHER SYSTEMS

| | |
|---|---|
| Thoracic injuries | 2 |
| Long bone fracture | 2 |
| Head injury | 2 |
| Total | 6 |

## TABLE – 6

## URETERAL INJURIES

The break up of cases with ureteral injuries are

| | |
|---|---|
| Penetrating injuries | 4 |
| Iatrogenic | 18 |
| Total | 22 |

## TABLE – 7

## IATROGENIC URETERAL INJURIES

| | |
|---|---|
| Total abdominal hysterectomy | 14 |
| Sub – total hysterectomy | 04 |
| Total | 18 |

## TABLE - 8

## IAROGENIC BLADDER INJURIES

| | |
|---|---|
| Total abdominal hysterectomy | 08 |
| Vaginal hysterectomy | 06 |
| Total | 14 |

## TABLE - 9

## AGE INCIDENCE OF URETHRAL INJURIES

| Age group | Male | Female | total |
|---|---|---|---|
| <10 | 0 | 0 | 0 |
| 11 – 20 | 2 | 1 | 3 |
| 21 – 30 | 6 | 0 | 6 |
| 31 – 40 | 6 | 1 | 7 |
| 41 – 50 | 2 | 0 | 2 |
| >51 | 2 | 0 | 2 |
| | | | 20 |

## DISCUSSION

There were totally 20 cases of renal injuries. Of these 11 were due to stab injuries accounting for 53% renal injuries and bunt injuries were 9 accounting for 47%.

The prolific cause of renal injuries in the west were blunt injuries and the commonest cause of penetrating renal trauma in the Parkland Memorial hospital study was gunshot injuries accounting for 79% while in our study stab injuries were the commonest cause.

The incidence of associated organ (non-renal) injuries is a significant factoring patients sustaining renal trauma. Carlton and associates in 1998, reported an incidence of 77% of non-renal injuries in penetrating renal injuries.

In this study 6 / 11 cases of penetrating renal injuries had associated splenic lacerations and injury to the splenic pedicle with a non-expanding retroperitoneal hematoma, all the cases underwent splenectomy. 3 cases had associated liver laceration which were sutured primarily. In 3 cases transverse mesocolonic tear and a pancreatic

hematoma was the associated injury and in another, injuries to ileum and ascending colon were present.

So in our study 9 /11 cases had associated major organ injuries accounting for 87.5% All 11 cases underwent emergency exploratory laparotomy.

**The breakup of Renal injuries in these 11 cases were as follows.**

In 2 cases there were Class – 1 injuries

only contusion of the kidney .

Thus managed conservatively.

In 3 cases there were Class – II renal injuries.

One patient had a capsular tear which was sutured

Other patients had a non expanding hematoma without parenchymal injury, hemostasis obtained.

In 4 patients there were Class – III renal trauma.

parenchymal laceration less than 1 cm depth sutured over a bolster and hemostasis obtained.

In 2 other patients there was Class -V renal trauma

completely shattered kidney or avulsion of the renal hilum which devascularies the kidney.

In one patient the renal pedicle was completely avulsed with active bleeding from the pedicle. Nephrectomy was done.

In this study 2 patient died out of 11 – this patient had splenic injury with retroperitoneal hematoma with class – I injury to left kidney. Splenectomy was done and the kidney injury was managed conservatively. Patient died in the post operative period due to multiorgan dysfunction secondary to hypovolemic shock. The mortality rate was 12.5% which is very much acceptable. This is due to the early diagnois and early surgical management and quick and effective of hypovolemic in patients with penetrating injuries.

Of the 9 patients with ***blunt injury abdomen*** all were due to RTA. One patient had associated fracture ribs and liver injury and a retroperitoneal hematoma.

Out of the 9 patients 3 patients were taken up for surgery immediately. One patient had features of severe hypovolemic shock and loin tenderness – it was Class – V Renal trauma – the left kidney was completely shattered – Nephrectomy was done.

In other two patients there were multiple rib fractures right side with features of peritonism due to hemoperitonium – emergency laparotomy done – there was associated severe injury Class – III with retroperitoneal hematoma. Since the condition of the patient was poor, perihepatic packing was done. Patient died in the immediate post operative period. Autopsy showed lacerated injury right kidney. For 4 patients emergency IVU was done – one was admitted with complaints of hematuria and pain right loin and abdomen. IVU showed non – visualization of lower calyces and irregular renal outline on the right side. CT scan showed injury to the lower part of the kidney. Since there was persistent hematuria, aortagram was done which showed pseudoaneurysm of the posterior segmental artery on the right side. Patient lost follow up. For other three patients CT scan was done as emergency, to confirm the diagnosis. CT scan showed injury lower pole of left kidney. Blood transfusion was given and patient was managed conservatively. Hematoma subsided with conservative line of management.

A 34 yr old male injured by RTA, presented with hematuria and right loin tenderness. Emergency USG showed a perinephric collection on right side. On laparotomy there was Class – V renal trauma – Nephrectomy done.

Another patient who had hemauria had pelvic fracture and urethral injury – he had abrasions over right loin. USG showed a perinephric collection which was managed conservatively. Hematuria subsided. This case is interesting in that when here is a patient with hematuria even though there is obvious urethral injury we should not be complacent as there can be associated upper urinary tract injuries.Out of the 9 patients one patient died and another patient was lost for follow up. The mortality rate is 11.2%

In Parkland Memorial Hospital, mortality rate was 10% (Peters and Bright)

**URETERIC INJURIES:**

Of the 4 patients with stab injuries there were associated organ injuries. One patient had a stab in the left loin, had abdominal guarding and an emergency lapartotomy was done. There was a partial thickness tear in the descending colon which was sutured and on mobilizing the descending colon, the ureter was found completely torn – primary anastomosis was done with a Double J stent. Patient had an uneventful recovery.

Two patients had stab injury in the left hypochondrium and back. On laparotomy the Jejunal and gastric injuries were sutured.

On 3rd post operative day there was urinary leak, IVP and RGP showed an upper ureteric extravasation. After stabilising the patient, an uretero-ureterostomy with a Double J stent done. Postoperative period was uneventful.

There were 18 cases of iatrogenic trauma i.e., 81.8% of total ureteric injuries.

Out of the 14 patients who underwent total abdominal hysterectomy,10 cases were for myoma uterus, 4 cases were for dysfunctional uterine bleeding. The other 4 patients had rupture uterus due to obstructed labour ending in emergency subtotal hysterectomy.

None of the 18 patients had hematuria as a symptom. Hematuria is present in 90% of ureteral trauma due to external violence but only in 10% due to iatrogenic injuires (Carlton, 1978). Patients had symptoms like perisistent abdominal pain, fever, ileus and a rising serum creatinine level in the immediate post operative period. The patients developed a watery vaginal leakage from the 7th to the 10th post operative day.

IVP was done in all the patients. IVP alone detects ureteral injury in 94% of cases and localizes injury in 50% of cases.

Retrograde pyelography done along with IVP establishes the level and extent of the ureteral injury.

In all these cases IVP showed obstruction of the ureter in the lower third. Iatrogenic injuries occur most commonly at the pelvic brim where the ureter crosses the iliac artery and posterior to the broad ligament, where it is crossed by the uterine artery (Dally and Higgins, 1988). USG done in these patients to know the status of the kidney. After diagnosis, open repair in the early convalescent period was done in 14 patients who underwent hysterectomy.

For all the 14 patients ureteroneocystostomy was done (Smith et al.). Ureteroneocystostomy with a Boari flap in 8 patients and a psoas hitch in 2 patients was done. In 12 out of the fourteen patients a Gibson incision was used while in 2 patients the previous incision was used. Using extraperitoneal exploration the ureter is identified as it crosses the iliac vessels. In 4 patients a direct ureteroneocystostomy was done as a tension – free anastamosis was possible. But in 8 persons as there was no possibility of providing a tension free anastomosis, a Boari flap was decided upon. Of the eight patients, 2 had a recurrent stricture giving a failure rate of 25%.

For other 2 patients a ureteroceocystostomy was combined with a psoas hitch. In all patients a Double J stent was placed and was removed 4-6 weeks later.

In 4 patients a sub total hysterectomy was done for ruptue uterus. In the post partum period repair was delayed and after 6 weeks surgery done. In 1 patient a ureteroneocystostomy was done with a Boari flap and in another patient psoas hitch, both recovered uneventfully.

## BLADDER

In our study there were 30 cases of bladder injuries. Of these, the cases due to penetrating and blunt trauma were 16 (53.3%) and iatrogenic trauma were 14 (47.65%)

Of these 16 cases due to external trauma, 10 cases were due to RTA i.e., blunt injury (62.5%) and 6 cases were due to stab injury (37.5%) Of these 10 cases, 8 patients were male giving a male : female ratio of 4 : 1. The youngest was a 17 year old, who had RTA with rupture bladder and fracture of the pelvis. 4 patients were in the 31 – 40 yrs age group, 2 in the 41 – 50 age group and two female patient, in the 31 – 40 age group.

Of these six patients with stab injury – four patients were males two in the 31-40 age group and two patient in the 41 – 50 age group. The female patients were in the 31 – 40 age group.

In all the 10 patients with blunt injury abdomen there was associated pelvic fracture. In 2 cases of stab, there were multiple stabs one in the suprapubic, one in the right iliac fossa and one on the right hypochondrium. There was associated ileal tear and Grade III liver trauma.

Out of the 16 patients with bladder trauma 10 had frank hematuria, 4 had abdominal distension and 2 had hemoperitoneum due to associated injuries. All the six patients with stab injury abdomen and six patients with RTA were taken up for surgery immediately. Of these, 4 patients had intraperitoneal rupture and 6 had extraperitoneal rupture of bladder. The rent was sutured in 2 layers from within. The trigone, ureteral orifices and bladder neck were inspected for injuries. In none of the patients in this series, was there associated ureteral injuries. A large bore SPC and a Foley's were kept in situ.

In other 4 patients with blunt injuries, there was no frank hematuria or sure signs of bladder rupture. So emergency cystography was done. In 2 patients, there was extraperitoneal rupture of bladder – flume like distribution of contrast was confined to pelvis. In the rest though the bladder was apparently normal, when the pressure due to contrast became more ( 300 ml) contrast was seen escaping into the peritoneal cavity.All the patients, were taken up for Laparotomy and repair of the rent done. Post operative period was uneventful.

Of the 16 patients, 2 had associated liver trauma and ileal perforation. Both succumbed post operatively to hypovolemic shock. The non – urologic injuries are associated with a high mortality rate in bladder injuries.(Cornere and Sandler)

**IATROGENIC INJURIES:**

There were 14 cases of iatrogenic injuries. All were females between 25 to 45 years, the reproductive age group, who had undergone hysterectomy. Out of the 14 patients, 6 had undergone vaginal hysterectomy and 8 were total abdominal hysterectomy.

The mean interval from the time of surgery to the development of symptoms in all the cases were from the seventh to the twelfth post operative days.

The patients had complete incontinence with persistent watery discharge through the vaginal vault and the patients were not able to void urine voluntarily. There was associated vulval and vaginal excoriations.

The diagnosis was confirmed by cystoscopy. In ten patients there was a supratrigonal VVF and four patients had a infratrigonal VVF. In two patients, with infratrigonal VVF the fistula was large and close to the left ureteric orifice. IVP and USG were also done.

The mean time of presentation was between 6 – 12 weeks. The longest time was one year in a patient, who had been with VVF for nine months, without treatment.

The patients were taken up for repair. Supra trigonal VVF patients have the least chance of associated ureteric injuries. In one patient with infra trigonal VVF the left ureteric orifice was very close to fistula site.

In all the patients a transvesical two layered closure of the VVF by a Pfannensteil incision.The bladder opened by a vertical incision. The fistula was either supra or infratrigonal, in either case the ureteric orifices was identified. Foley's catheter was introduced through the fistula and the balloon inflated in the vagina.

By an encircling incision around the bladder wall , the vaginal wall separated. The first layer i.e., the vaginal wall was closed with 3-0 vicryl and the bladder wall closed with 2-0 vicryl. Methylene blue is injected through the urethra and it is inspected whether the dye comes out through the vagina. After a secure approximation a Malecot's suprapubic cystostomy is done and a Foley's catheter introduced via naturalis. In one patient a ureteroneocystostomy was combined.

In this study, following VVF repair only one was a failure with leak through the vagina and a re-repair of the fistula, which is technically more difficulty due to the fibrosis around the fistulous tract, was done. The post operative period was uneventful.

The simple, but very effective way of preventing these iatrogenic injuries is by preoperative urethral catheterization and by adhering to dissection in the correct plane.

## URETHRA

Urethral trauma in the female is much less common than the male because of the shortness of the urethra.

### POSTERIOR URETHRA

In this study there were 20 cases of posterior urethral injuries. Of these 2 were females, a 11 year old girl who sustained crush injuries over the lower abdomen and a 38 year old woman who was involved in a RTA. All others were male, with a male female ratio of 9 : 1.

The youngest in this group was a female of age 11 yrs and the oldest was a male of age 58 yrs.Out of the 20 patients, 17 were involved in RTA and 3 were involved in crush injury. 18 patients in this study had associated fracture of pelvis – a fracture rate of 90%.

Out of the 20, 7 patients were able to void urine although 4 had gross hematuria. The remaining 13, could not void urine. Of these 20 patients, 12 had perineal hematoma. There was blood at the meatus in 8 of the patients. On rectal examination in 12 patients the prostate was not felt in the normal location of prostate.

In all the patients after stabilizing the patient a well lubricated No.16 Fr Foley's catheter was passed once. In 8 patients the catheter passed in without difficulty. Six of these eight patients had type I posterior urethral injury and 2 patients had type II injury with partial tear of the urethra. Urethral catheterization was kept for 7 – 14 days. In all these patients the mild injuries healed without sequelae.

In the other 12 patients there was difficulty in passing a Foley's catheter and so SPC was inserted in 11 patients.

One patient required a laparatomy for associated rectal injury. The posterior urethral rupture could be better handled by initial suprapubic cystostomy alone (Morehouse et al).

A retrograde urethrography was done in all the 11 patients. Of these 9 patients had complete rupture of the posterior urethra and 2 had partial rupture. All patients in a mean time of 12 – 18 weeks, were taken up for surgery. In 2 patients through endoscopic approach, internal meatotomy was done – cutting the fibrosed tissue. In the other 9 a transpubic urethroplasty was done. Of these 6 patients came for regular follow up and 3 lost follow up. 2 of these 6 patients had impotence – 33.3%.

## ANTERIOR URETHRA

In this study there were 15 cases of injuries to the anterior urethra. The majority of the patients were in the age group 20 – 50 years . The youngest was a twelve year old boy who sustained injury falling astride a post.

The commonest cause of injuring was blunt injury to the perineum in 7 cases. In 8 patients the injury was caused by falling astride an object in 4 cases it was a bicycle and in one it was the typical man – hole injury. In the other 2 patients – one was a mentally deranged person who in a fit of anger chopped off the whole shaft of the penis and in another case it was a partial tear of the anterior urethra due to stab injury.Out of the 15 patients, 5 patients could pass urine via naturalis. So a well lubricated gentle catheterization with a No.16 Fr Foley's was done. Catheter was kept in situ for 14 days. Patients were discharged without sequelae.

Of the 10 patients, 6 had hematuria and 8 could not void urine via naturalis. The patient with self – mutilated penis had a large hematoma and the patient with stab in his penis had free bleeding from the stab injury site.

Surgical exploration, debridement and direct repair are indicated in injuries to the anterior urethra. Out of the 10 patients in 6 patients there was only partial urethral lacerations which were debrided and closed over a urethral catheter with 4-0 polygycolic acid suture. A catheter was kept in situ for 14 days. Two of these patients developed fibrosis on follow up and one patient, had extravasation which was repaired again.

In two patients there was complete disruption of the urethra a direct end to end anastamosis was done. The ends of the urethra was spatulated to provide a large calibre anastamosis and a catheter was left in situ for 14 days. One patient was lost for followup, the other patient, had no postoperative sequelae.

In the patient who had self mutilated his penis, due to the large hematoma, primary repair could not be done and so after exploration, debridement and hemostasis, a SPC was done. After 8 weeks patient was taken up for perineal urethrostomy but it was a failure due to the dense fibrosis and the urethra could not be brought out as perineal urethrostomy. Patient lost followup.

For the next patient with complete disruption as a primary end to end anastamosis was not possible and hence SPC was done.

After 12 weeks two staged urethroplasty was done.

# CONCLUSION

- Retroperitoneal injuries constitute 16% of all abdominal injuries
- Renal injuries form the major part of retroperitoneal injuries 23.8%
- In renal trauma penetrating injuries are the commonest.
- Stab injury is the most common form of penetrating injury
- Associated major organ injuries were the cause of mortality in patients with renal trauma.
- The commonest cause of ureteric injuries were iatrogenic.
- Gynecological surgeries constituted all cases of iatrogenic ureteric injuries in the study.
- The prognosis of patients for whom ureteral surgery was done for VVF was excellent.
- External trauma and iatrogenic injuries have an equal share in bladder injuries.
- In this study, the commonest cause of urethral injuries were blunt injury.
- Posterior urethral injuries were best managed by delayed repair.
- Anterior urethral injuries were best managed by early surgical exploration.

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# PROFORMA – STUDY ON UROLOGICAL TRAUMA

Name: Age: Sex: Occ:

Date of injury: Date of admission:

Nature of injury:

Blunt: Stab: RTA: Iatrogenic:

Name of Surgery:

Why it was done?

Complaints:

Clinical parameters on Admission:

Pulse Rate: Blood Pressure: Consciousness:

Heart Rate: Respiration: Urine Output:

External Injuries:

Abdominal Injuries:

Associated Injuries:

Investigations:

Urine: Hb: Blood Sugar:

Blood Urea: Blood Grouping:

Sr.Creatinine:

Plain X-Ray KUB area:

IVP: RGP:

USG: CT:

Date of Surgery: Surgery done:

Operative findings:

Postoperative period:

Complications:

Late management:

Complications:

Prognosis:

# MASTER CHART

| Sl No | NAME | AGE/ SEX | IP NO | DOA | MODE OF INJURY | INJURIES | MANAGEMENT | COMPLICATION |
|---|---|---|---|---|---|---|---|---|
| 1 | Muthulaxmi | 42/ F | 367841 | 12/12/2005 | Iatrogenic | r- UI(TAH-DUB) | UNC | Nil |
| 2 | Raja Mohd | 32/ M | 391017 | 15/12/2005 | Blunt | PU: # Pelvis | SPC, Foley Cath | Stricture |
| 3 | Karuppasamy | 17/ M | 400126 | 30/12/2005 | Stab | Renal contusion | Conservative | Nil |
| 4 | Govindammal | 38/ F | 11078 | 13/01/2006 | Crush | PU: # Pelvis | SPC, Foley Cath | Nil |
| 5 | Mari | 45/ M | 15389 | 19/01/2006 | Blunt | BR; #Pelvis | SPC, Foley Cath | Nil |
| 6 | Pitchai Muthu | 42/ M | 17324 | 28/01/2006 | Blunt | Renal lace.; RPH | Raphy | Nil |
| 7 | Ayyakannu | 36/ M | 20985 | 3/2/2006 | Blunt | AU | Foley Cath | Stricture |
| 8 | Pothumponnu | 39/ F | 21753 | 12/2/2006 | Iatrogenic | UI(TAH- Myoma) | UNC | Urinoma |
| 9 | Christopher | 35/ M | 23714 | 27/02/2006 | Stab | BR; Liver lace | Repair & SPC | Nil |
| 10 | Jeevanathan | 28/ M | 24553 | 4/3/2006 | Stab | Renal&Spleen lace | Splenctomy | Nil |
| 11 | Arumugam | 27/ M | 26638 | 21/03/2006 | Blunt | BR; #Pelvis | SPC, Foley Cath | Nil |
| 12 | Maheshkumar | 28/ M | 28911 | 28/03/2006 | Stab | AU | Foley Cath | Nil |

| Sl No | NAME | AGE/ SEX | IP NO | DOA | MODE OF INJURY | INJURIES | MANAGEMENT | COMPLICATION |
|---|---|---|---|---|---|---|---|---|
| 13 | Muthurakku | 43/ F | 31007 | 7/4/2006 | Stab | Renal lace.; mesocolon tear | Repair | Nil |
| 14 | Chellathayi | 42/ F | 31938 | 9/4/2006 | Iatrogenic | BR(VH) | Foley Cath | VVF |
| 15 | Pandi | 45/ M | 34228 | 17/04/2006 | Blunt | PU: # Pelvis | SPC, Foley Cath | Nil |
| 16 | Selvameena | 32/ F | 36345 | 26/04/2006 | Iatrogenic | UI(TAH- Rupture) | UNC | Nil |
| 17 | Mari | 58/ M | 38987 | 30/04/2006 | Stab | Renal lace; pan-creatic hematoma | Raphy | Nil |
| 18 | Murugan | 35/ M | 41265 | 9/5/2006 | Blunt | Shattered kidney | Nephrectomy | Nil |
| 19 | Basim Ali | 31/ M | 42398 | 14/05/2006 | Iatrogenic | AU | Foley Cath | Nil |
| 20 | Kulandaisamy | 42/ M | 44231 | 18/05/2006 | Stab | BR; Ileal tear | Primary Repair | Nil |
| 21 | Gopi | 39/ M | 45276 | 23/05/2006 | Stab | UI; Jejunal tear | UU; Repair | Stricture |
| 22 | Muthalayappan | 40/ M | 48535 | 31/05/2006 | Stab | Renal,Spleen, Liver lace | Repair; Splenectomy | Nil |
| 23 | Arokiamary | 44/ F | 51237 | 10/6/2006 | Iatrogenic | UI(TAH- Myoma) | UNC | Nil |
| 24 | Ramachandran | 33/ M | 53287 | 16/06/2006 | Blunt | BR;#Pelvis | SPC, Foley Cath | Nil |
| 25 | Manickam | 27/ M | 56231 | 21/06/2006 | Iatrogenic | AU | Repair & SPC | Fistula |
| 26 | David | 47/ M | 57268 | 27/06/2006 | Blunt | Renal, Liver lace | Repair | Died |
| 27 | Anbu | 27/ M | 59812 | 7/7/2006 | Blunt | PU | SPC, Foley Cath | Nil |
| 28 | Pandiselvam | 39/ M | 62137 | 14/07/2006 | Blunt | PU;#Pelvis | SPC, Foley Cath | Stricture |

# MASTER CHART

| Sl No | NAME | AGE/ SEX | IP NO | DOA | MODE OF INJURY | INJURIES | MANAGEMENT | COMPLICATION |
|---|---|---|---|---|---|---|---|---|
| 29 | Muthayammal | 36/ M | 63245 | 17/07/2006 | Stab | Renal, Spleen lace | Splenectomy | Nil |
| 30 | Panneer Selvam | 44/ m | 65902 | 21/07/2006 | Stab | Renal, Liver lace | Repair-Both | Nil |
| 31 | Marial | 32/ F | 66983 | 24/07/2006 | Iatrogenic | UI(TAH- Myoma) | UNC | Nil |
| 32 | Ilandevan | 44/ M | 67361 | 27/07/2006 | Blunt | BR; #Pelvis | SPC, Foley Cath | Nil |
| 33 | PonPandian | 37/ M | 69261 | 31/07/2006 | Blunt | AU | Repair & SPC | Nil |
| 34 | Mathi | 41/ M | 71429 | 10/8/2006 | Stab | UI; Desc colon tear | UU; Repair | Stricture |
| 35 | Pavithran | 18/ M | 75320 | 15/08/2006 | Stab | Renal, Ileal lace | Repair | Nil |
| 36 | Mayan | 55/ M | 78163 | 21/08/2006 | Blunt | AU | Repair & SPC | Nil |
| 37 | Muthumari | 34/ F | 79418 | 25/08/2006 | Iatrogenic | UI(TAH- Myoma) | UNC | Urinoma |
| 38 | Ayyasamy | 53/ M | 82917 | 28/08/2006 | Blunt | Renal lace | Conservative | Nil |
| 39 | Chinnan | 31/ M | 86290 | 31/08/2006 | Stab | BR; Ileal tear | Repair, SPC | Infection |
| 40 | KausyaBegam | 36/ F | 91803 | 4/9/2006 | Iatrogenic | UI(TAH- Rupture) | UNC | Nil |
| 41 | Chinnapandi | 24/ M | 94275 | 11/9/2006 | Blunt | BR;#Pelvis | SPC, Foley Cath | Nil |

| Sl No | NAME | AGE/ SEX | IP NO | DOA | MODE OF INJURY | INJURIES | MANAGEMENT | COMPLICATION |
|---|---|---|---|---|---|---|---|---|
| 42 | PandiMeena | 39/ F | 97286 | 16/09/2006 | Iatrogenic | r- UI(TAH-DUB) | UNC | Nil |
| 43 | Muthupandi | 40/ M | 99264 | 24/09/2006 | Stab | Renal, Spleen lace | Splenectomy | Died |
| 44 | Arumugam | 20/ M | 102187 | 30/09/2006 | Blunt | BR; #Pelvis | SPC, Foley Cath | Infection |
| 45 | Pavithran | 11/ F | 106435 | 3/10/2006 | Crush | PU;#Pelvis | SPC, Foley Cath | Stricture |
| 46 | RameshPandi | 36/ M | 108923 | 10/10/2006 | Blunt | BR | SPC, Foley Cath | Nil |
| 47 | Solaimalai | 21/ M | 127653 | 16/10/2006 | Blunt | Shattered kidney | Nephrectomy | Nil |
| 48 | Valliamal | 37/ F | 127686 | 17/10/2006 | Iatrogenic | BR(VH) | Repair; SPC | VVF |
| 49 | Parthiban | 42/ M | 130367 | 25/10/2006 | Blunt | AU | Repair& SPC | Stricture |
| 50 | Karthi | 30/ M | 137892 | 30/10/2006 | Blunt | BR;#Pelvis | SPC, Foley Cath | Nil |
| 51 | JohnMary | 43/ F | 143760 | 7/11/2006 | Iatrogenic | UI(TAH- Myoma) | UNC | Nil |
| 52 | Balu | 51/ M | 148567 | 13/11/2006 | Stab | AU | Foley Cath | Nil |
| 53 | Manickam | 28/ M | 163478 | 25/11/2006 | Blunt | Renal lace.,RPH | Repair | Nil |
| 54 | Kavitha | 40/ F | 198263 | 2/12/2006 | Iatrogenic | UI(TAH- Myoma) | UNC | Nil |
| 55 | MuthuIrulan | 33/ M | 235603 | 14/12/2006 | Stab | UI; RPH | UU | Stricture |
| 56 | Kathayee | 43/ F | 267140 | 26/12/2006 | Iatrogenic | UI(TAH- Rupture) | UNC | Infection |

# MASTER CHART

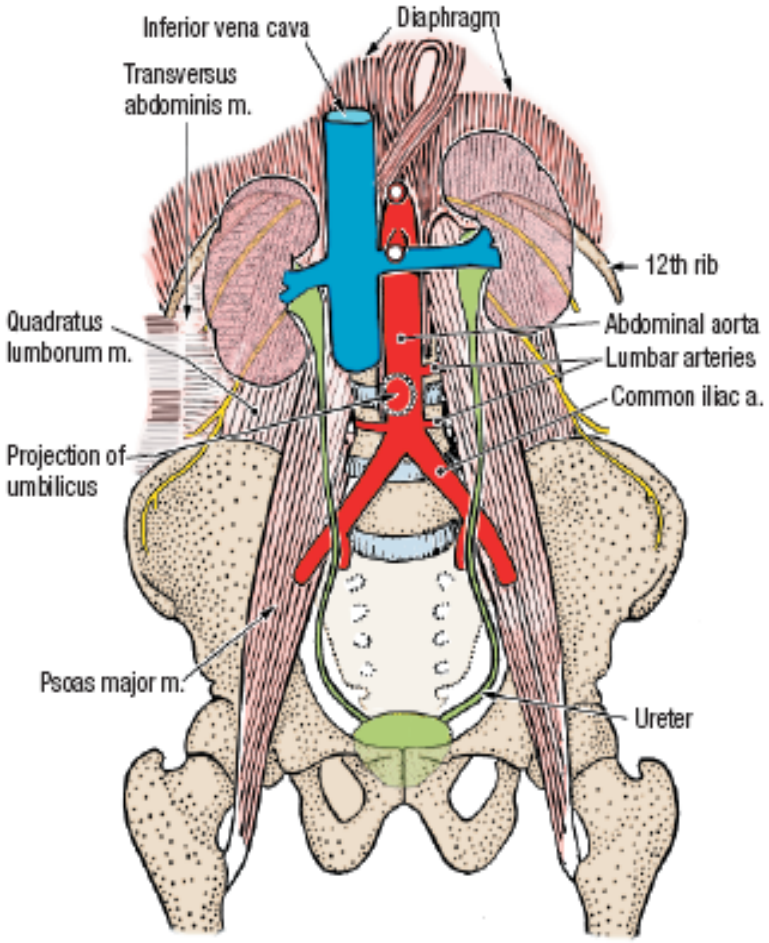
| Sl No | NAME | AGE/ SEX | IP NO | DOA | MODE OF INJURY | INJURIES | MANAGEMENT | COMPLICATION |
|---|---|---|---|---|---|---|---|---|
| 57 | Mayi | 45/ M | 1039 | 7/1/2007 | Blunt | BR;#Pelvis | SPC, Foley Cath | Nil |
| 58 | PandiMuthu | 32/ M | 1208 | 16/01/2007 | Stab | Renal, Spleen lace | Splenectomy | Nil |
| 59 | Arputhamary | 41/ M | 2198 | 22/01/2007 | Iatrogenic | UI(TAH- Myoma) | UNC | Nil |
| 60 | Subramani | 25/ M | 3920 | 27/01/2007 | Blunt | Renal, Liver lace, #Ribs | Repair | Nil |
| 61 | Mariammal | 43/ F | 4237 | 29/01/2007 | Iatrogenic | BR(VH) | Foley Cath | VVF |
| 62 | Ganesan | 20/ M | 5348 | 5/2/2007 | Stab | Renal Pedicle lace | Nephrectomy | Nil |
| 63 | Thavamani | 31/ F | 6651 | 17/02/2007 | Blunt | Renal contusion | Conservative | Nil |
| 64 | Senthil | 49/ M | 6992 | 22/02/2007 | Stab | UI; Jejunal tear | UU; Repair | Died |
| 65 | Rakku | 39/ F | 8159 | 27/02/2007 | Blunt | Renal contusion | Conservative | Nil |
| 66 | Perumayee | 38/ F | 9301 | 3/3/2007 | Stab | BR; Ileal tear | Repair, SPC | Nil |
| 67 | Laxmi | 49/ F | 10625 | 10/3/2007 | Iatrogenic | UI(TAH- Myoma) | UNC | Nil |
| 68 | Guruvan | 45/ M | 12774 | 14/03/2007 | Blunt | AU | Repair& SPC | Nil |
| 69 | Maruthayee | 33/ F | 13860 | 19/03/2007 | Blunt | BR; #Pelvis | SPC, Foley Cath | Stricture |

| Sl No | NAME | AGE/ SEX | IP NO | DOA | MODE OF INJURY | INJURIES | MANAGEMENT | COMPLICATION |
|---|---|---|---|---|---|---|---|---|
| 70 | Pandiammal | 47/ F | 14712 | 22/03/2007 | Iatrogenic | UI(TAH-DUB) | UNC | Nil |
| 71 | Arumugam | 19/ M | 15578 | 28/03/2007 | Stab | Renal lace.; RPH | Raphy | Nil |
| 72 | Panju | 27/ F | 16268 | 4/4/2007 | Blunt | BR; #Pelvis | SPC, Foley Cath | Nil |
| 73 | Manjula | 33/ F | 16930 | 11/4/2007 | Iatrogenic | UI(TAH- Myoma) | UNC | Infection |
| 74 | RamaiahChettiar | 51/ M | 17129 | 18/04/2007 | Iatrogenic | AU | Repair & SPC | Nil |
| 75 | Selvi | 43/ F | 17943 | 22/04/2007 | Iatrogenic | UI(TAH- Rupture) | UNC | Stricture |
| 76 | Karuppan | 24/ M | 19230 | 27/04/2007 | Stab | Renal lace.; RPH | Raphy | Nil |
| 77 | Periyamaruthu | 40/ M | 21007 | 29/04/2007 | Blunt | AU | Repair& SPC | Nil |
| 78 | Kannathal | 27/ F | 23711 | 30/04/2007 | Iatrogenic | UI(TAH- Myoma) | UNC | Urinoma |
| 79 | Alagammal | 48/ F | 24705 | 3/5/2007 | Stab | Renal lace.; RPH | Conservative | Nil |
| 80 | Meena | 50/ F | 26712 | 10/5/2007 | Iatrogenic | UI(TAH-DUB) | UNC | Nil |
| 81 | Ochammal | 39/ F | 28103 | 12/5/2007 | Stab | BR | SPC, Foley Cath | Nil |
| 82 | Pandi | 30/ M | 30165 | 18/05/2007 | Stab | Renal lace.; RPH | Raphy | Nil |
| 83 | Persy | 37/ F | 31873 | 21/05/2007 | Iatrogenic | BR(VH) | Repair; SPC | VVF |
| 84 | Karruppayee | 52/ F | 33981 | 26/05/2007 | Iatrogenic | UI(TAH-DUB) | UNC | Nil |

# ABBREVIATIONS

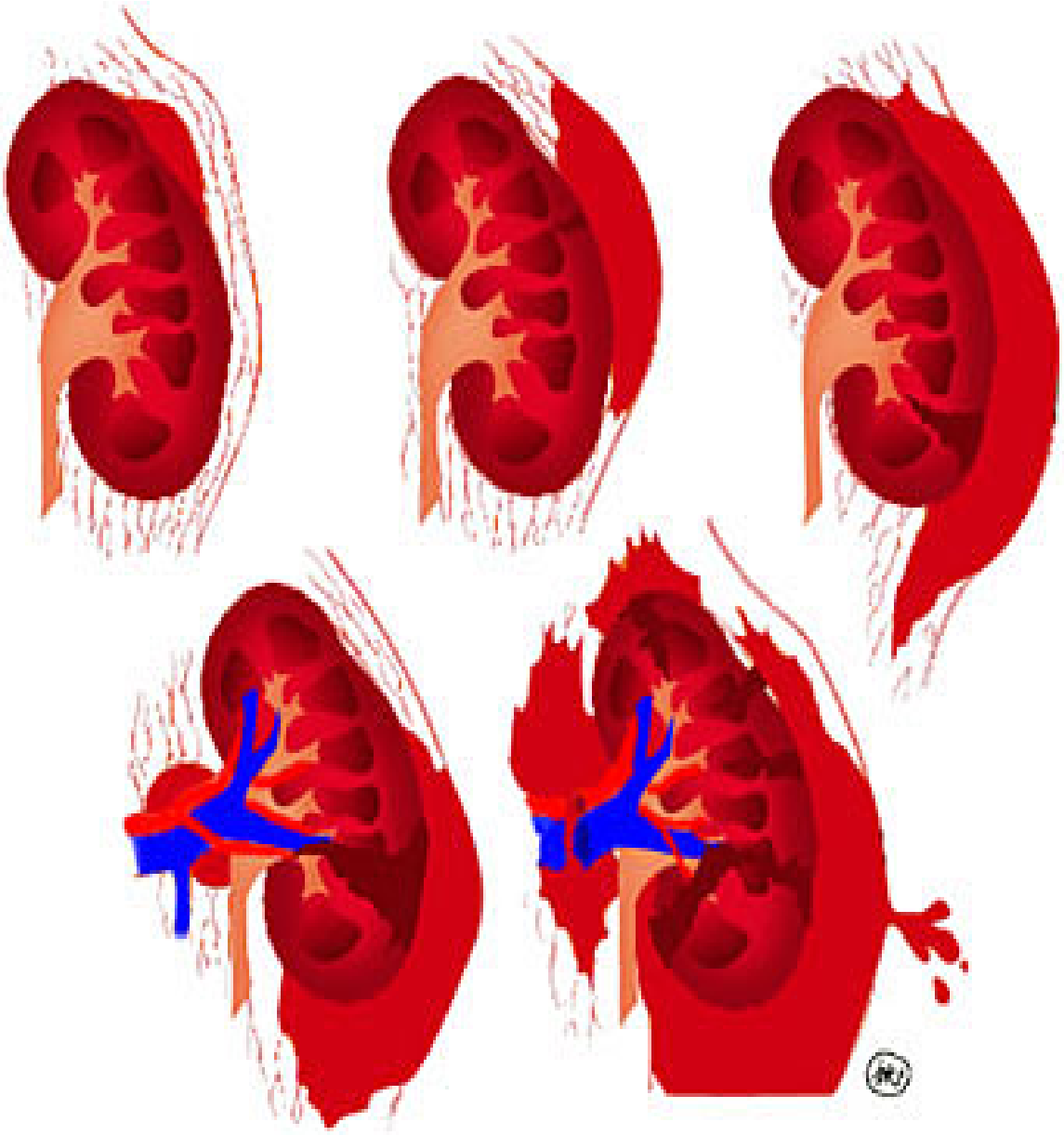
| | | |
|---|---|---|
| UI | – | Ureteric Injury |
| BR | – | Bladder Injury |
| UNC | – | Ureteroneocystostomy |
| UU | – | Ureteroureterostomy |
| PU | – | Posterior Urethral Injury |
| AU | – | Anterior Urethral Injury |
| TAH | – | Trans Abdominal Hysterectomy |
| VH | – | Vaginal Hysterectomy |
| SPC | – | Surapubic Catheterisation |
| DUB | – | Dysfunctional Uterine Bleeding |
| Rupture | – | Uterine Rupture |
| lace | – | laceration |
| VVF | – | Vesico Vaginal Fistula |
| RPH | – | Retroperitoneal Hematoma |

# RELATIONS OF KIDNEY



# RENAL INJURY SCALE

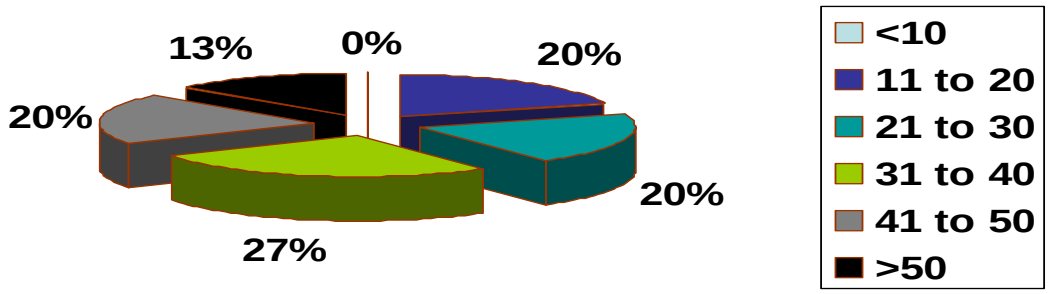
**GRADE – I** **GRADE – II** **GRADE – III**



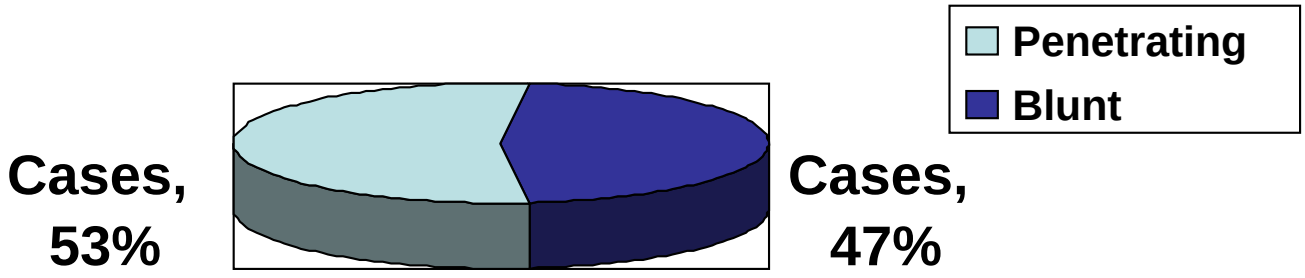
**GRADE – IV** **GRADE – V**

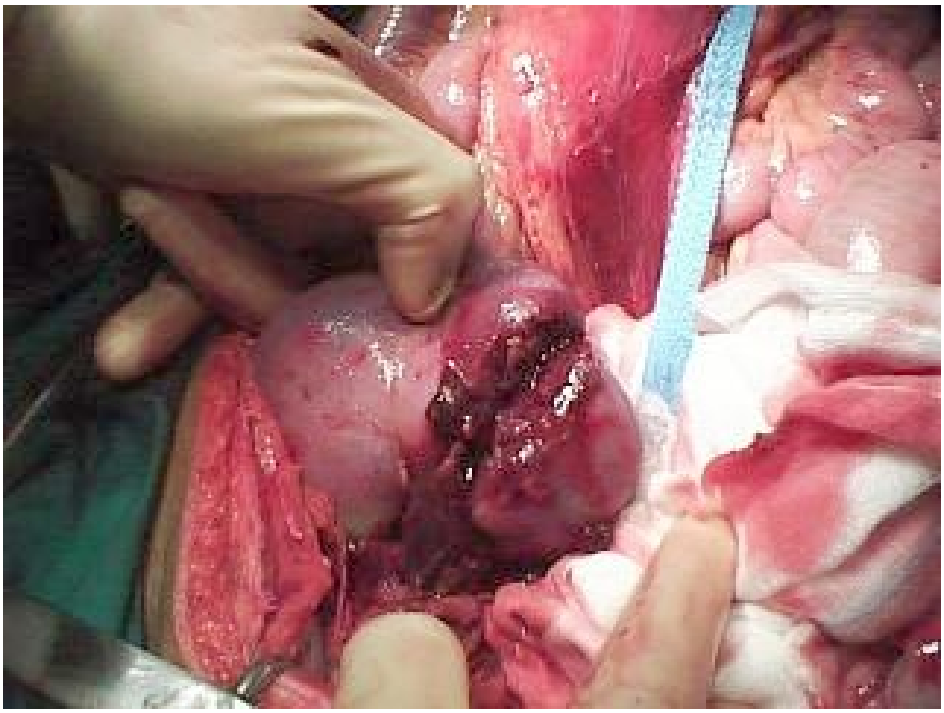
# AGE INCIDENCE OF RENAL INJURIES

PERCENTAGE OF CASES AGE IN YEARS

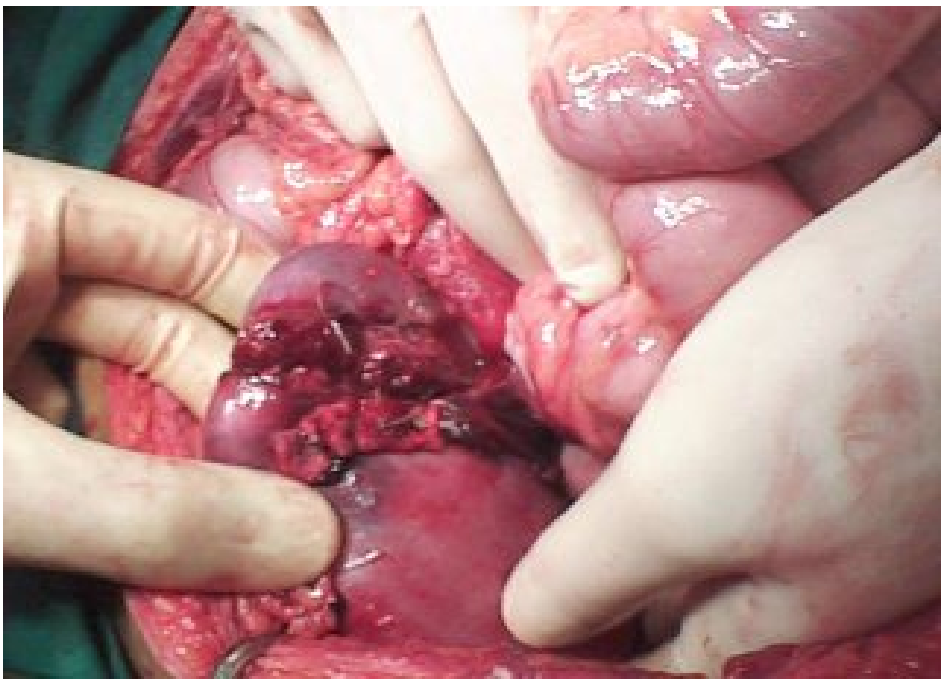



RENAL INJURIES – ETIOLOGICAL TYPE





**RENAL LACERATION GRADE- II**



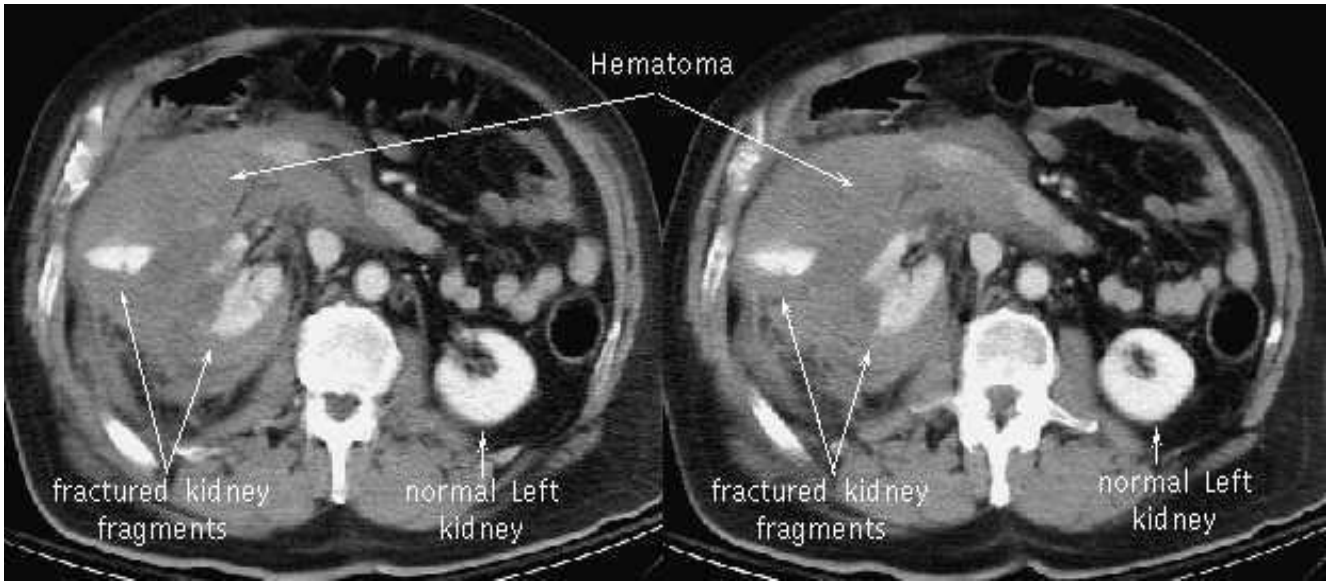
**RENAL LACERATION – CONSERVATIVE MANAGEMENT**

**MULTIPLE STAB INJURY ABDOMEN**

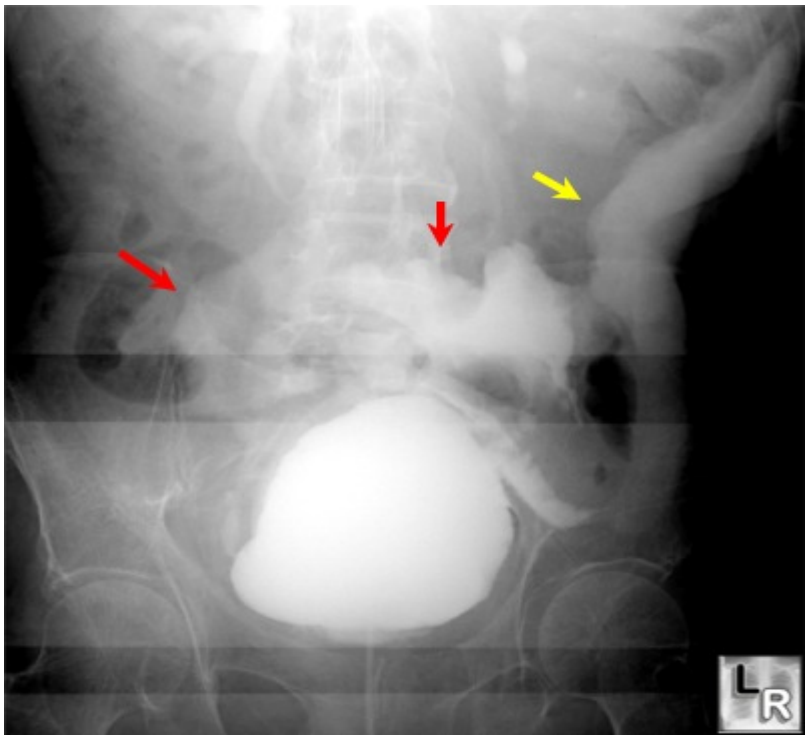
**PERINEPHRIC HAEMATOMA**

**GRADE- V RENAL INJURY PLAIN X-RAY FILM**

## GRADE- V RENAL INJURY CONTRAST CT FILM




## CYSTOGRAM - IPBR



# CYSTOGRAM - EPBR